



South Coast AQMD: Reducing Air Pollution, GHG Emissions, and Petroleum Dependence

**May 31, 2007
2nd AB32 ETAAC Meeting**



Chung Liu, D.Env.

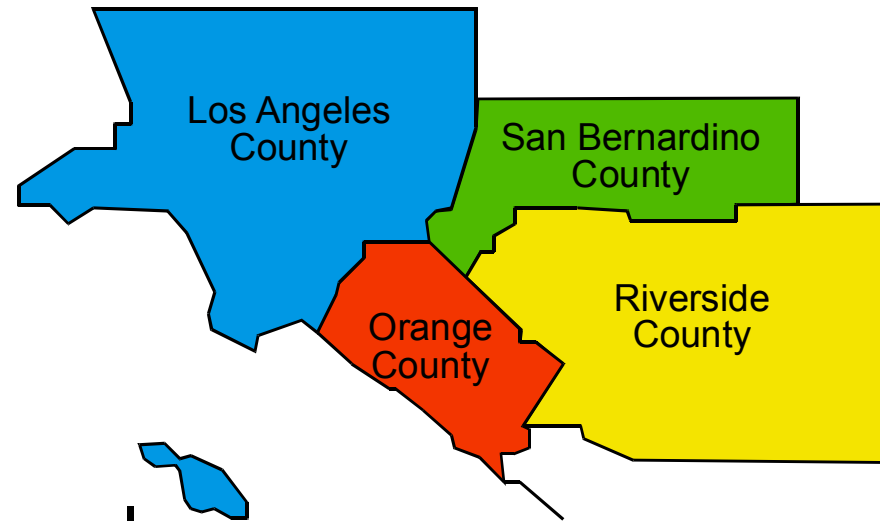
Deputy Executive Officer

South Coast Air Quality Management District

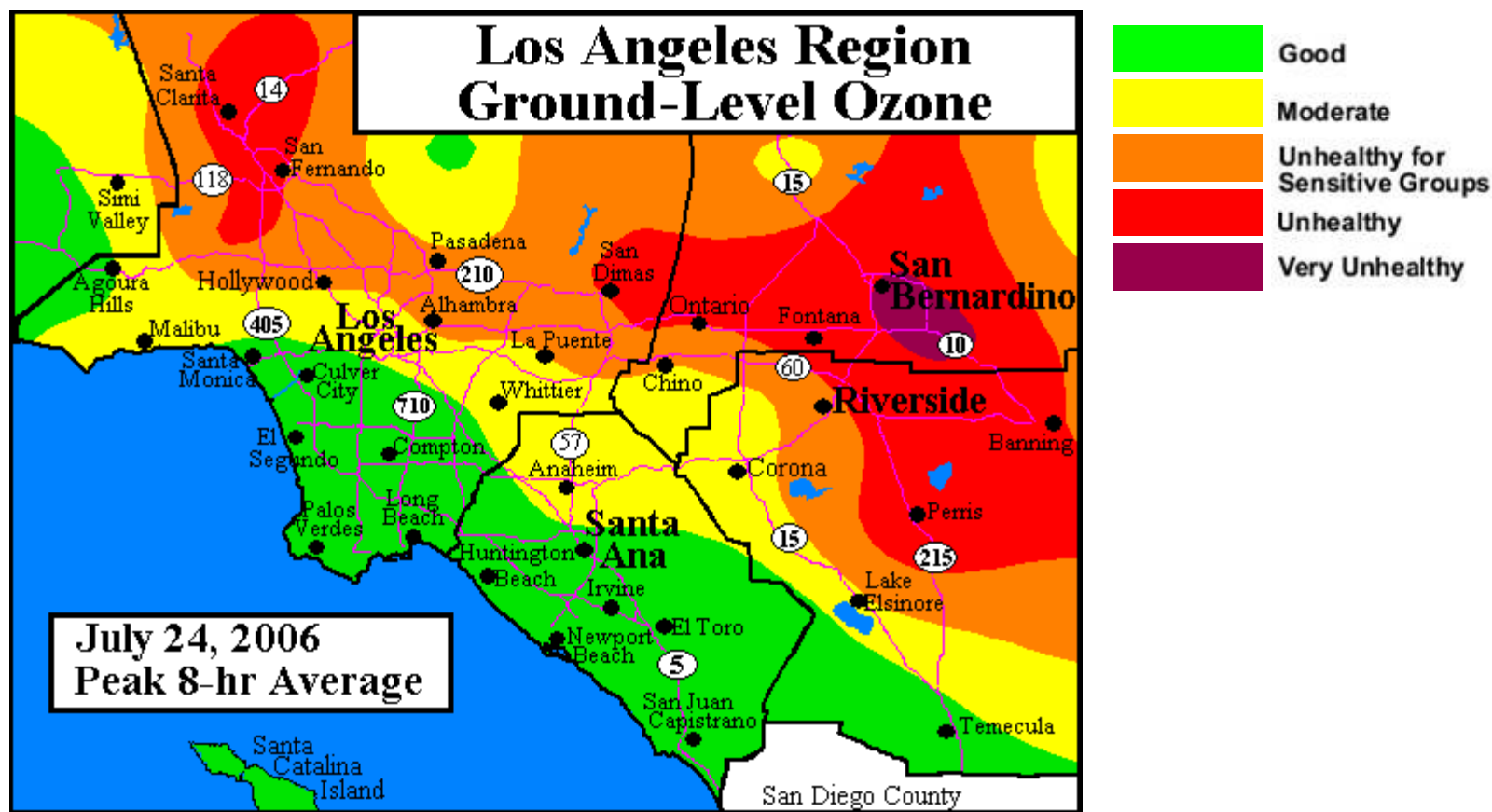
AQMD Background Setting

South Coast Basin:

- 4-county region
- 11,000 sq. miles
- 16+ million residents
- Hundreds of thousands diesel vehicles
- Millions of gasoline vehicles
- Combined Ports of Long Beach and Los Angeles are 5th largest cargo gateway



Severe Air Quality Problem Requires Cleaner Mobile Technologies



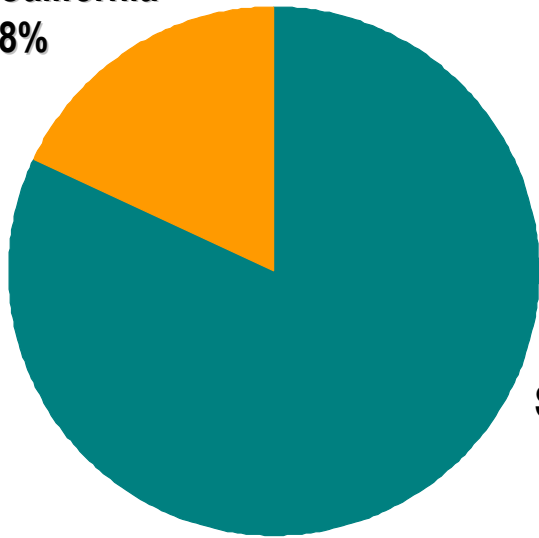
Most Particulate-Polluted Counties (annual avg PM_{2.5})

1. **Riverside, CA**
2. **San Bernardino, CA**
3. **Los Angeles, CA**
4. Kern, CA
5. Tulare, CA
6. Allegheny, PA
7. Fresno, CA
8. Wayne, MI
9. **Orange, CA**
10. Kings, CA

South Coast Air Basin's Disproportionate Air Pollution Exposure

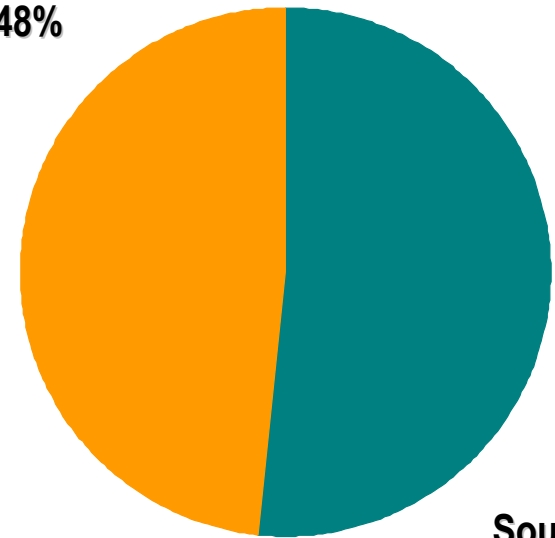
Annual PM2.5
(NAAQS = 15 $\mu\text{g}/\text{m}^3$)

Rest of California
18%



South Coast
82%

Rest of Nation
48%



South Coast
52%

Population-weighted and minus NAAQS, based on 2000-02 AIRS data

Recent CARB Assessment of PM Health Effects



Cases/Year due to PM_{2.5} in South Coast*

Premature Deaths	5,400
Hospitalizations	2,400
Asthma & Lower Respiratory Symptoms	140,000
Lost Work Days	980,000
Minor Restricted Activity Days	5,000,000

* 1999-2000 Air Quality Data

Plug-in Hybrids

Previous Plug-in Hybrid Projects

- EPRI Market Study (2000)
- UC Davis (2000 & 2003)
- SCE Utility Truck (2001)
- AC Propulsion Tri-fuel Jetta (2001 & 2005)



Light-Duty PHEV Projects

- EnergyCS – 5 Priuses
 - Two being tested
 - 3rd, 4th, and 5th accumulating mileage
- Thirty Vehicle Program
 - 20 Quantum Escapes
 - 10 Hymotion Priuses
 - Awarded March 2007



Medium-Duty PHEV Projects

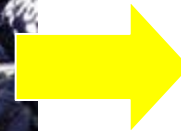
- EPRI-DaimlerChrysler Sprinter
 - Phase 1: Two prototypes
 - Phase 2: Five passenger vans
- EPRI-Ford/Eaton Boom Truck
 - Awarded February 2007



“Plug-in California” Initiative

Mayor Ron Loveridge proposed state initiative at September 28, 2006 CARB Board Meeting

- State agencies to promote/purchase PHEVs
- Establish reduced electric rates
- Incentives to OEMs (e.g, ZEV, GHG credits)
- Consumer incentives (e.g, HOV, buydown)
- Business friendly environment for suppliers
- Dedicate \$5M of AB1811 funds to PHEVs



Fuel Cells and Hydrogen

History of Support

- In 1989, the AQMD co-funded \$2.4M with the DOE to develop a fuel cell/battery powered transit bus
- In 1991, the AQMD contributed \$1M to the first Ballard Fuel Cell Bus project
- In 1992, the first-ever commercial stationary fuel cell unit was installed at the AQMD
- To date, the AQMD has awarded over \$11M for fuel cell and hydrogen projects, leveraging over \$100M of outside funds

Stationary Fuel Cells

- Two 250kW FCE units at TST Foundry in Fontana
- Three 5 kW Plug Power units in Irvine
- Member of CA Stationary Fuel Cell Collaborative



The map displays the Hydrogen Highway Network in California, connecting major cities and regions. The network is highlighted in orange, showing routes from the San Francisco Bay Area through the Central Valley to Los Angeles and San Diego. Key locations marked include San Francisco, San Jose, Sacramento, Fresno, Bakersfield, Los Angeles, Orange, Anaheim, Irvine, San Diego, and San Jose. The map also shows the Pacific Ocean, the Gulf of Santa Catalina, and various state highways. A legend in the top right corner indicates that the orange line represents the Hydrogen Highway Network, the blue circle represents a Hydrogen Station, and the white car icon represents an H2 ICE Prius. A text box in the top right corner states: "10 Hydrogen Stations" and "30 H2 ICE Priuses".

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Heavy-Duty

Heavy-Duty Engines

- Advanced Heavy-Duty Natural Gas Engines
- Hydrogen-CNG Internal Combustion Engines
- Diesel Engines



Hybrid Buses

- CNG Hybrid Transit Bus
- Hydraulic Hybrid Shuttle Bus
- Hydrogen ICE Hybrid Bus



Biofuels

Biofuels

- Biodiesel in waste transfer trucks + Selective Catalytic Reduction
- Ethanol at low and higher level (E85) blends
- Need to evaluate NO_x and HC (evaporative) emissions



Hot Gas

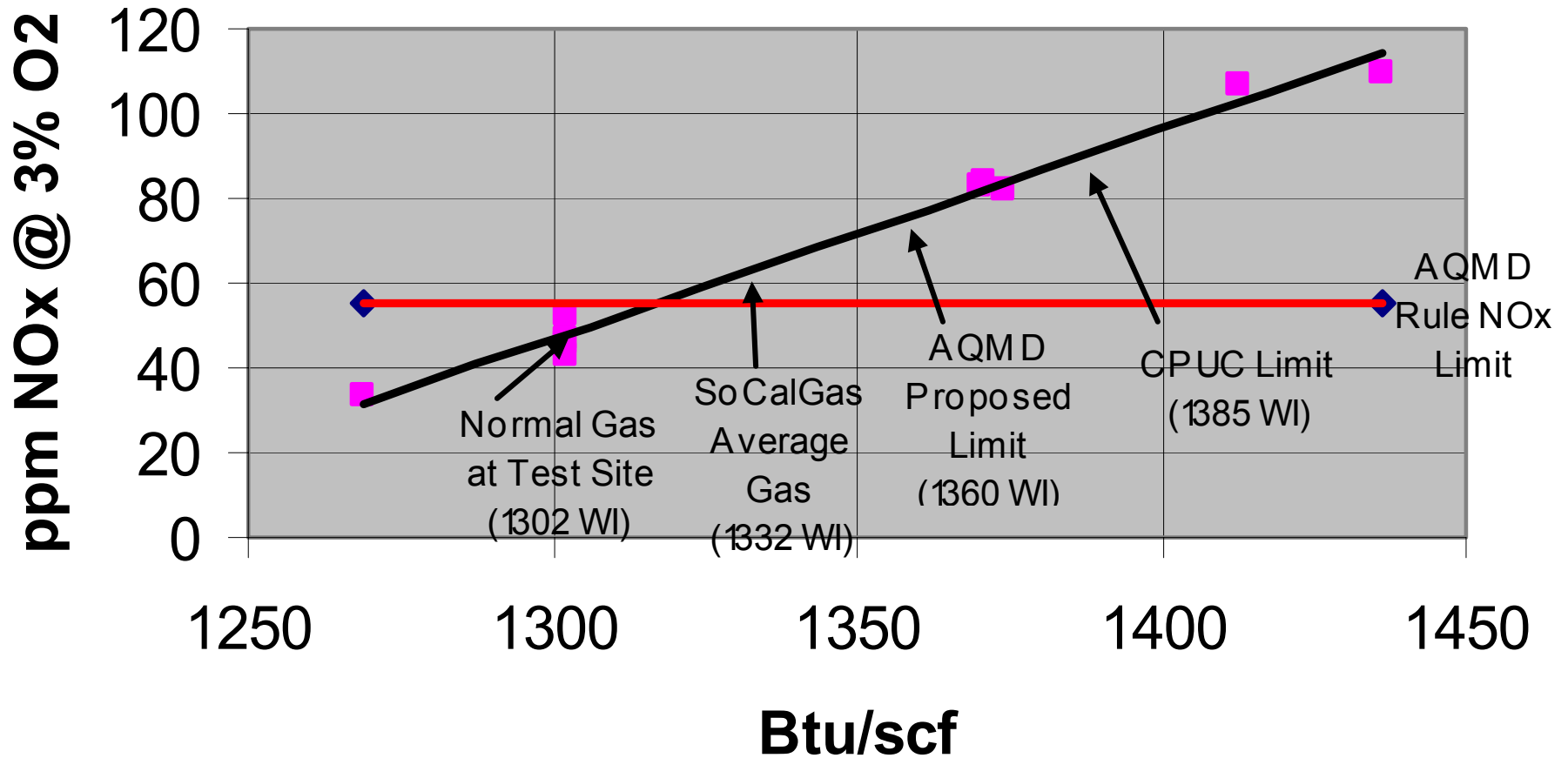
LNG Emissions

- New LNG terminals are being built or are proposed
- LNG has higher NO_x and CO₂ emissions than current natural gas

California LNG Projects

LNG Project	Capacity Bcf/day	% of SoCalGas Demand*
Cabrillo, BHP Billiton	0.8	32%
Clearwater, Crystal Energy	1.0	40%
Long Beach LNG, SES	0.7 -1.0	28-40%
Woodside Energy	0.8	32%
Esperanza Energy	tbd	tbd
Sempra/Shell–Baja CA	1.0	40%
Total	4.3 -4.6	172-184%

Steam Boiler NOx vs. Wobbe Index



LNG Properties

- Higher ethane and propane levels, which emit more CO₂ than methane:
 - Ethane: 14% more CO₂ per million Btus
 - Propane 20% more CO₂ per million Btus
- Well-to-burner analysis must consider high energy losses of:
 - Liquefying the gas
 - Transporting from Asia/Middle East/Russia
 - Regasifying the LNG

RECLAIM

RECLAIM

- 1st multi-industry cap-and-trade program in US
- NO_x and SO_x, ~350 largest emitters
- Annual cap and declining balance
 - Locks in emission reductions
 - Flexibility and lower costs
 - Better monitoring of emissions
- Over 12 years of implementation experience that is valuable for other program designers

Districts Experience with Facilities Likely to be in AB32

- Decades of experience with refineries, power plants, cement, major emitters
- Annual Emissions Reporting program
- CEQA Review
- Permits
- Rules
- Frequent Inspections
- Continuous Emission Monitoring

District's Efforts – GHG Reductions

- Many rules have concurrent GHG reductions
- Technology Advancement
- Member of Climate Action Registry
- Energy Efficient Building
- Fleet of Alternative Fuel Vehicles

Technology Forum & Roundtable Topics

Topic	Date
Ethanol (esp. low blends)	June 15, 2006
Plug-in Hybrid Electric Vehicles	July 12, 2006
In-Use Diesel Vehicle Emissions	September 20, 2006
Ozone Forum	October 31, 2006
Biodiesel	November 7, 2006
Container Movement	January 26, 2007
Cellulosic Ethanol	February 15, 2007
Smog Check	March 21, 2007
Cap and Trade -- RECLAIM Example	April 25, 2007
Off-Road Emissions Reductions	May 1, 2007